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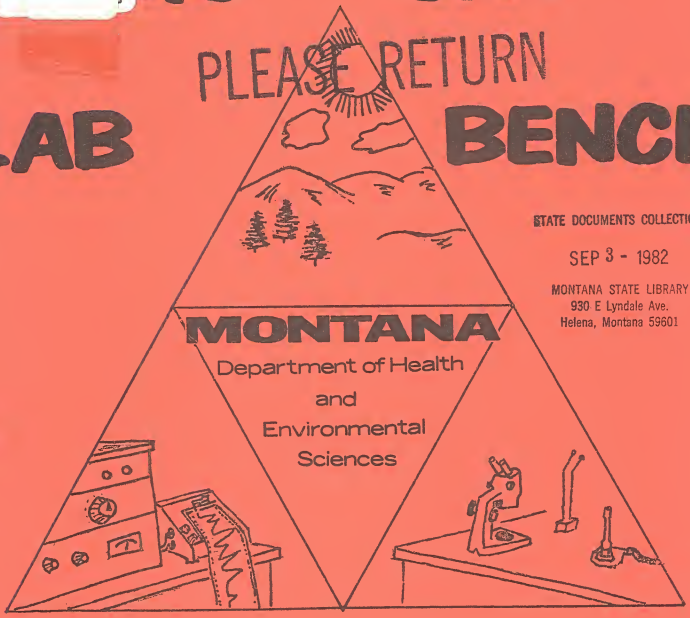

ANNUAL REPORT for FISCAL YEAR 1975

Laboratory Division

David B. Lackman, Ph.D., Administrator

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THIS ISSUE OF THE ANNUAL REPORT IS DEDICATED TO *STUART MUDD, M.D.*, PROFESSOR EMERITUS OF MICROBIOLOGY, THE SCHOOL OF MEDICINE, UNIVERSITY OF PENNSYLVANIA

Dr. Mudd passed away on May 6, 1975 at the age of 81 years. His visionary approach to the Medical Sciences was an inspiration to his students; among whom I had the good fortune to be numbered. At the Cold Spring Harbor Laboratory, in the summer of 1933, I first met Dr. Mudd. Since then, his sympathetic guidance, understanding and leadership has been a dominating influence, for it was my great opportunity to have been chosen as one of his "original" graduate students. Together we explored the new world of the electron microscope and published pictures which were the first electron micrographs of bacteria to appear in the U.S. Here, in Dr. Mudd's own words, is a recollection of our first encounter with this instrument. *"In 1938, I believe, Dr. V. K. Zworykin, head of the RCA Research Laboratories, had invited Dr. L. Marton from Brussels to set up his pioneer electron microscope in the RCA Laboratories. The high-powered physicists and engineers at RCA were as innocent about biological specimens as I was about precision circuits and electron lenses. I will never forget my first visit to the RCA Laboratories. Pictures were to be seen of objects resolved at several scores of times the light microscope is capable of. I felt much as Alice must have felt when she dropped down the rabbit's hole."* (Annual Review of Microbiology 23 : 1-28, 1969).

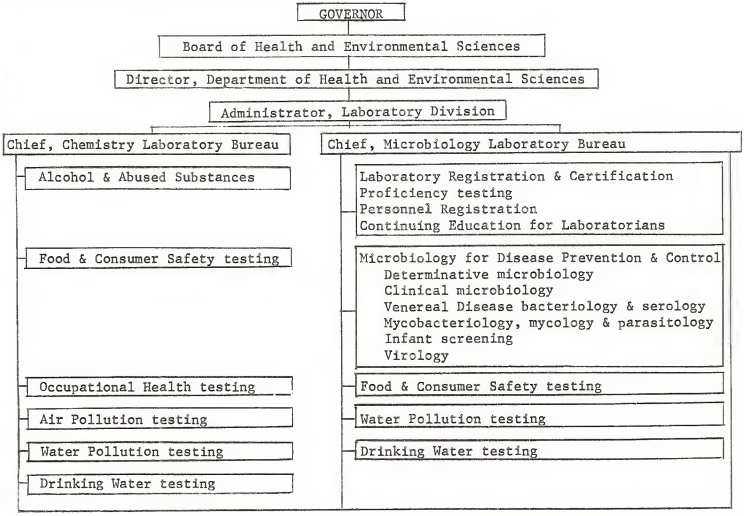
The elucidation of the many factors involved in phagocytosis, the pathogenesis of staphylococcal infections, the discovery that nucleic acids have specific immunologic capabilities, and the book, "Infectious Agents and Host Reactions", are but a few of Dr. Mudd's legacies which place him, in the annals of microbiology, alongside pioneers such as Louis Pasteur, Robert Koch, and Theobald Smith.

The breadth of Dr. Mudd's concern for the social implications and the applications of discoveries in the Medical Sciences is exemplified in a statement from his Will establishing the Stuart and Emily B.H. Mudd Professorship in the fields of family relations, human reproduction and social interaction. *"It has been my life-long belief that the good life for Man, as well as the preservation of the resources of our planet, depend fundamentally upon the quality and quantity of the human population. Stabilization of population of good quality depends upon biomedicine, together with a whole web of human interactions within families and societies. This Professorship is suggested in considerable part as a tribute to my wife, Emily Borie Hartshorne Mudd, who has been ever mindful of the fundamental need for quality and quantity of population, and who has dealt creatively with the many facets of human interaction within families. It is my wish that this Professorship be established in the Department of Obstetrics and Gynecology of the University of Pennsylvania, with explicit understanding that wisdom and expertise from the Department of Psychiatry and from the social sciences shall be integrated with the biomedical operations of the Department of Obstetrics and Gynecology."*

INTRODUCTION

A major accomplishment this year has been the implementation of Chapter No. 227, Montana Session Laws 1973, Sections 69-6710 through 69-6713, R.C.M. 1947 and Montana Administrative Code 16-2.18 (6)-S1820 INFANT SCREENING TESTS. In cooperation with the Maternal and Child Health Bureau, we culminated an agreement to become part of "The Oregon Metabolic Disorders Screening Program." We consider this to be a most practical way for Montana to have a meaningful program of highest quality. The first specimens were sent to the Public Health Laboratory in Oregon on January fifth. Specimens are screened for phenylalanine, leucine, methionine, tyrosine, galactose, and thyroid deficiency. It is hoped that by early detection and treatment, the effects of such diseases as phenylketonuria, maple syrup urine disease, homocystinuria, tyrosinemia, galactosemia and congenital hypothyroidism may be prevented and the population of institutions such as Boulder materially reduced. Montana has been singled out for this venture as a leader in regional cooperation. Those who would carve the country into super states sometimes cite a figure of 2,000,000 souls as the minimum unit of population for a state government to exist as an efficiently run entity; but can the economy of Montana support 2,000,000 persons? Currently we are experiencing difficulties with 735,000. Regional cooperation and coordination to a much greater extent than practiced now appears to me to be a partial solution. Our virus laboratory, tacked onto the Cogswell Building, was built with such an objective in mind.

Here is a functional diagram of the Laboratory Division and its relationship to higher echelons of state government. It delineates the multiplicity of our activities and serves as an outline for this report.



CHEMISTRY LABORATORY BUREAU -

Walter A. Jankowski, Chief

1. Alcohol & Abused Substances - Michael J. Harrington, Section Head

ALCOHOL : The "Implied Consent" law, Section 32-2142, R.C.M. 1947 gives legal status to the determination of alcohol in body fluids. Thirty-five court appearances were made this year. These were mostly in connection with appeals from DWI charges but others involved negligent homicide and murder. An information sheet is compiled for each appearance with the intention of using it for a report on how we can increase the effectiveness of the laboratory in supporting law-enforcement personnel in their efforts to remove intoxicated drivers from the highways of Montana.

There are 14 Alco-Analyzers and associated equipment on loan to local law-enforcement agencies. We inspect these annually and at other times when trouble arises. Sometimes a replacement instrument is sent by highway patrol and the faulty one returned to us for servicing. Standard solutions are supplied for Simulators and unknowns for testing proficiency of the 200 operators are sent to installations periodically. The following is a record of Alco-Analyzers, by location, for fiscal year 1975.

City	No. of Tests	No. ≥ 0.10%*	No. of Refusals	Unit Proficiency
A. Billings	391	381	99	0.005
B. Missoula	228	218	21	0.006
C. Kalispell	199	195	20	0.005
D. Wolf Point	168	158	21	0.005
E. Bozeman	162	152	32	0.004
F. Havre	104	97	36	0.007
G. Great Falls	101	100	13	0.005
H. Helena	101	93	54	0.007
I. Glasgow	98	97	31	0.006
J. Miles City	74	72	9	0.004
K. Glendive	60	52	18	0.004
L. Lewistown	47	45	9	0.004
M. Butte	36	34		0.008
N. Shelby	32	30	6	0.006
Totals	1801	1724	369	0.005**

*This is the "legal" limit. In some states it is 0.08% and in Sweden it is 0.06%. Based on experience, we are in complete agreement with those who believe it should be lowered to 0.06%.

**This is the average deviation.

In addition to approval of methods and the operations of others, we also perform analyses on samples submitted to us. The Center for Disease Control and the States of Florida and California check our proficiency. We furnish containers for blood and urine and the SM-7 Sobermeters for samples of breath. Here is our activity report :

Sample type	Number of tests	Number ≥ 0.10%
Breath	838	790
Blood	832	627
Urine	51	45
Totals	1721	1462
Alco-Analyzers in the field	1801	1724
In the State Laboratory	1721	1462
Totals	3522	3186 (90.5%)

Informational sessions with lawyers, judges, law-enforcement officials, and the interested public constitute another important activity in this unit. At least once a year a chemist conducts a demonstration session at the Law Enforcement Academy in Bozeman.

The alcohol program is supported by funds from the Department of Transportation through the Highway Safety Division. The amount spent in the laboratory under this contract for fiscal year 1975 was $46,386. When it comes to preventing human suffering and death, this program has great potentialities.

ABUSED SUBSTANCES : Most of the work in this area is done under agreement with state projects : Southwestern Montana Drug Program (SWMDP), Lighthouse Project, and the Addictive Disease Unit (ADU). A charge of $6.00 per specimen or sample is made; we supply specimen containers. Drug screens are done using thin-layer chromatography with gas chromatography for confirmation of those positive by thin-layer. Pharm-Chem Laboratories, Palo Alto, California is used as a reference laboratory for suspected abused substances. Here is the record of activity in this program :

Program	Number of tests	Number positive
Screening of body fluids		
SWMDP	194	19
Lighthouse	346	4
Other sources	104	24
	644	47
Screening of substances		
SWMDP	25	12
ADU	15	8
Other sources	49	37
	89	57
Total drugs	733	104

Drugs etc. encountered :

Amphetamines	10	Methadone	6
Barbiturates	22	Carbon Monoxide	7
Alkaloids	7	Other Psychotropics	52
			104

(In the program of the Department of Defense, urine is screened for traces of opiates, barbiturates, and amphetamines. Testing for other substances may be done when indicated by local usage.)

Total analyses performed in this unit (alcohol 1462, abused substances 733) numbered 2,195 which represents an increase of 12 percent over last year. However, the concentrated emphasis on quality control also resulted in increased activity. This we feel is very important in work of this nature. In CDC's proficiency testing program for drugs, we have an accumulative grade of 88; a satisfactory rating.

Here is a summary of activity of personnel in this section :

Man-days in the laboratory	621.5	87.8%
Man-days in the field	41.5	5.9%
Man-days leave	45	6.3%
	708.0	100.0%

2. Food and Consumer Safety testing -

Thomas Daly, Section Head

MONTANA CHILDHOOD LEAD POISONING CONTROL PROJECT : We have been the recipients of a grant from CDC for this project. Its purpose is to enable state public health laboratories to establish capability for screening samples of blood from children for lead content. An Atomic Absorption unit was purchased and the Delves Cup method set up as the procedure for this. Ninety specimens were analyzed from the East Helena study being conducted by CDC. Now we are starting to receive specimens from the EPSDT program, a project to screen medicaide-eligible children for health hazards. We have also received samples from students at the Vo-Tech school, Boulder River Hospital, and Lewis & Clark County Health Department. During the year, 244 samples were tested. Some elevated levels were found in one smelter neighborhood and a high level was observed in a patient at Boulder. Considerable resistance to this project has been encountered because a childhood lead-poisoning problem doesn't appear to exist in Montana. However, that is what we are supposed to find out. Eleven paint samples and one ceramic cup were also tested for lead.

FOOD : Hamburger seems to be a problem in Montana because state standards require that it contain no more than 20 percent fat, whereas Federal standards allow 30 percent. Samples analyzed numbered 221, 93 of which contained more than 20 percent fat and 9 of these more than 30 percent. Nine samples of bread were analyzed for iron content. Iron is being used as an indicator of compliance with State law requiring enrichment of bread. One sample of cat food was tested for arsenic.

PESTICIDES : Determinations of cholinesterase activity have been done on pesticide applicators. This year 150 specimens were tested. Due to malfunctions in a gas chromatograph intended for use in pesticide analysis, none have been performed. Now, however, in cooperation with our Solid Waste Bureau, money has been secured through an EPA project grant to establish a new pesticide analytical facility. A Tracor 222 gas chromatograph has been purchased along with supplies and chemical hoods. This will be the only complete facility in the state for testing for pesticides and performing certain other assays requiring gas chromatography. It is our intent to avoid unnecessary duplication in other departments of state government by offering our services, at cost, to them.

3. Occupational Health testing

Thomas Daly, Section Head

We perform most of the laboratory tests required by the Safety and Health Bureau of the Workmen's Compensation Division in the Department of Labor and Industry. This is done under a formal agreement which provides for reimbursement on a cost basis. Our present costs for services provided under this agreement are :

Metals by Atomic Absorption spectrophotometry (AAS)	
Except As, Hg, Se	$8.00 (one component per sample)
	$3.00 (each additional component)
As, Hg, Se	$10.00 (one component per sample)
	$5.00 (each additional component)
Organic Solvents by gas chromatography	
	$25.00 (one component per sample)
Free Silica	$60.00 per batch of 5 or fewer samples
Coal Tar Pitch Volatiles (Benzene solubles)	
	$40.00 per batch of 4 or fewer samples
Analysis of coal samples for sulfur content	
	$25.00
Pesticide determination (quant. and qual.)	
	$35.00 minimum
Asbestos counting	$35.00

For estimating costs we use this format :

TIME / COST STUDY

Analysis _____

Analyst _____ Date ___/ ___/ ___

Samples _____ Number of Repeats _____

Blanks / Standards _____

Ref. Standards _____

Duplicates _____

Spikes _____

Total Analyses _____

COMMENTS

	Started	Interrupted / Ended
ANALYSIS		
CALCNS.		
REPORT		

Specimens received = 466 Examinations = 742

Three human sera were checked for lithium levels.

Parameters include : fluoride, phosphorus, sulfuric acid, lead, copper, zinc, iron, manganese, cadmium, free silica, chromium, antimony, silver, nickel, phosphoric acid/phosphate, beryllium, mercury.

4. Air Pollution Testing -

Warren Norton, Section Head

This year 6906 analyses were done on 5891 specimens in the Air Quality Section of the laboratory. They were distributed as follows :

	Samples	Determinations
Fluoride papers	1378	1378
Fluoride plates	80	80
Fluoride tape samples	165	165
Fluoride bicarbonate tubes	14	14
Fluoride vegetation	604	648
Other Fluoride samples (bees, bone, urine, coal)	156	156
Sulfation plates	490	490
Sulfur Dioxide Bubblers	209	209
Nitrogen Dioxide Bubblers	161	161
Dustfall Determinations	84	84
Acid Aerosol Samples	16	16

Total Sulfur - Leco Furnace	50	50
B.T.U. Calorimeter Determinations	16	22
Membrane filters	275	275
Anderson - Particle sizing	881	881
Hivol Samples - Total Suspended Particulate	1159	1159
Hivol Samples - Metal Determinations	141	1106
Other Analyses - Benzene Soluble Extraction	2	2
pH Determinations	10	10
Totals	5891	6906

There has been an increasing variety of samples brought to the laboratory. No longer do we deal only with samples of air. For example, we have had requests for fluoride determinations on urine, bone, honey bees, and coal. There have been requests for total sulfur on vegetation and fuel oil; carbonate in limestone; and fluoride in scrubber-pond water. Interest in all types of analyses on coal has developed because of the planned expansion of strip-mining activity in eastern Montana. A new Parr colorimeter was installed in August 1974 to provide capability for determining B.T.U. values of coal, oil, and other fuels. A special project was determining sulfur content on 20 samples of coal from Colstrip for the Department of Natural Resources.

Laboratory personnel spent 29.5 man-days assisting in setting up or maintaining field samplers. One day each was spent attending a chemistry seminar at Montana State University in Bozeman and visiting the laboratory of the State Bureau of Mines in Butte.

Increased interest in coal, which is likely to continue, requires that we have proper equipment for sample preparation. Presently we do not have adequate crushing, grinding, or splitting equipment. This is one of the immediate needs of the section.

5. Water pollution testing -

John Hawthorne, Section Head

In water pollution control, 19,088 tests were performed on 1912 samples. Parameters included : dissolved oxygen, phosphates, BOD, COD, pH, conductivity, turbidity, residue, dissolved solids, calcium, magnesium, sodium, chloride, alkalinity, sulfate, nitrate, nitrite, ammonia, Kjeldahl nitrogren, fluoride, phenols, color, hardness, tannins and lignins, cyanide, iodine, oil and grease, organic carbon, hydrogen sulfide, acidity, iron, zinc, copper, lead, cadmium, arsenic, manganese, selenium, cobalt, boron, potassium, chromium, hexavalent chromium, vanadium, molybdenum, aluminum, lithium, beryllium, silicon, mercury, nickel, silver, strontium, tin, barium, titanium and tungsten.

Bioalgalassays were run on four waters to determine the limiting nutrient in eutrophication. Also, 10 samples of soil were tested for fluoride, orthophosphate, iron, copper, zinc, cadmium, arsenic, manganese, lead, aluminum, nickel, calcium, magnesium, sodium chloride, alkalinity and sulfate.

6. Drinking water testing -

John Hawthorne, Section Head

We are preparing for full implementation of the Federal "Pure Drinking Water Act" in Montana by July 1976. This year 696 samples from supplies used for drinking were submitted to 3824 examinations. Our "standard chemical" consists of tests for : calcium, magnesium, sodium, iron, sulfate, fluoride, nitrate, chloride, pH, hardness, alkalinity, and conductance; dissolved solids are calculated. The complete examination was performed on 217 samples. Requests for individual tests have included : nitrate, iron, fluorides, hardness, specific conductance, orthophosphate, arsenic and manganese, lead and cadmium, silver, barium, chromium, mercury, selenium, potassium, Kjeldahl nitrogen, pH and chloride, sodium, copper, sulfate and organic carbon, zinc, calcium and magnesium, tin, chlorine residual, and miscellaneous.

The following table giving the lower limits of detection for methods used in our water chemistry laboratory was compiled this year.

Parameter	Method	Detection Limit (mg/l)
Acidity	Titrimetric	1.
Alkalinity	Titrimetric	1.
Aluminum	Atomic Absorbtion	.1
	Ferron	.05
Antimony	Atomic Absorbtion	.2
Arsenic	Vapor Generation--A.A.	.001
Barium	Atomic Absorbtion	.1
Beryllium	Atomic Absorbtion	.005
BOD	Modified Winkler	1.
Boron	Curcumin	.1
Cadmium	Atomic Absorbtion	.002
	A.A. w/Extraction	.0005
Calcium	EDTA Titration	.8
	Atomic Absorbtion	.003
Chloride	Mercuric Nitrate	.5
Cobalt	Atomic Absorbtion	.03
COD	Dichromate Reflux	5.
Chromium	Atomic Absorbtion	.02
	A.A. w/Extraction	.002
Color	Comparison Tubes	5.
Copper	Atomic Absorbtion	.01
Cyanide	Pyridine-Pyrazolone	.02
Fluoride	Auto Analyzer	.05
	Electrode	.05
Hardness	EDTA Titration	2.
Iron	Atomic Absorbtion	.05(.02 can be obtained (on certain favorable samples)
Lead	Atomic Absorbtion	.05
	A.A. w/Extraction	.0005
Lithium	Atomic Absorbtion	.05
Magnesium	EDTA Titration	1.
	Atomic Absorbtion	.0005
Manganese	Atomic Absorbtion	.01
MBAS	Methylene Blue	.01
Mercury	Cold Vapor--A.A.	.0002
Molybdenum	Atomic Absorbtion	.1
	Dithiol	.001
Nickel	Atomic Absorbtion	.02
Nitrogen, Ammonia	Auto Analyzer	.01
Nitrogen, Kjeldahl	Auto Analyzer w/Micro Digestion	.05
Nitrogen, Nitrate	Auto Analyzer	.01
Nitrogen, Nitrite	Auto Analyzer	.01
Oil & Grease	Seperatory Funnel	1.
Organic Carbon	TOC Analyzer	1.
Phenol	4-Aminoantipyrine	.001
Phosphate	Auto Analyzer	.001
Potassium	Emission	.1
Residue	Gravimetric	.1
Selenium	Vapor Generation--A.A.	.002
Silica	Molybdosilicate Method	1.
Silver	Atomic Absorbtion	.05
	A.A. w/Extraction	.005

Sodium	Emission	.002
Specific Conductance	Wheatstone Bridge	1.
Strontium	Atomic Absorbtion	.1
Sulfate	Auto Analyzer	10
	Thorin Titration	1
Sulfide	Iodine Method	.2
Tannin-Lignin	Colorimetric	.1
Tin	Atomic Absorbtion	.8
Turbidity	Nephelometric	.5
Vanadium	Atomic Absorbtion	.2
	Gallic Acid	.001
Zinc	Atomic Absorbtion	.01

¢ ¢

¢ *The 1974 edition of this report contained a complete listing of methods used* ¢
in the Environmental Chemistry Laboratory as well as a discussion of plans
¢ *for the future with emphasis on needed additions to equipment and facilities.* ¢
A revised and updated version of this material will be included in the 1976
¢ *narrative report. Although this portion has been omitted for 1975, consider-* ¢
able progress towards realization of goals set last year has occurred in
¢ *spite of frustrations which are always with us in government.* ¢

¢ ¢

1. Determinative bacteriology

This activity continues to be one area in which Montana has attaned stature nationally. Bud Brown serves as a reference laboratory for CDC and for two state proficiency testing programs. Here is the list of organisms from clinical sources that have been speciated this year.

Species name	Number of isolates	Sources
Achromobacter xylosoxidans	1	Femur head
Acinetobacter calcoaceticus var. *anitratus*	20	5 throat; 4 abscess; 4 wound; 4 ear; 1 eye; 1 urine, 1 post synovial
Acinetobacter calcoaceticus var. *lwoffi*	13	3 urine; 2 vaginal; 2 throat; 1 eye; 1 wound; 1 sputum; 1 callus; 1 knee drainage; 1 peritoneum
Aeromonas hydrophila	3	1 sputum; 1 water sample; 1 proficiency
Aeromonas shigelloides	1	proficiency
Alcaligenes faecalis	1	foot abscess
Arizona hinshawii	1	proficiency
Bacillus cereus	1	wound
Bacillus licheniformis	3	1 appendix; 1 vaginal; 1 wound
Bacillus subtilis	2	1 eye; 1 lesion
Bacillus sp.	20	5 wound; 3 abscess; 2 skin lesion, 2 ear; 2 CSF; 1 stool; 1 sputum; 1 urine; 1 eye; 1 throat; 1 unidentified
Bacteroides corrodens	2	1 abscess; 1 ear
Bacteroides fragilis subsp. *fragilis*	1	blood
Bacteroides fragilis subsp. *distasonis*	1	ear
Bacteroides fragilis subsp. *thetaiotaomicron*	1	ear
Bacteroides fragilis	37	17 abscess; 9 wound; 7 blood; 1 lochia; 1 gall bladder; 1 fallopian tube; 1 ear
Bacteroides melaninogenicus	9	4 abscess; 2 blood; 1 ear; 1 maxillary cyst; 1 cervix
Bacteroides oralis	2	1 dog bite; 1 peritoneal fluid

Bacteroides sp. CDC Group F-1	1	surgical wound
Bacteroides sp. CDC Group F-2	2	1 breast abscess; 1 lung abscess
Bordetella bronchiseptica	2	1 throat; 1 nose
Bordetella pertussis	2	1 throat; 1 nasopharynx
Branhamella catarrhalis	7	2 throat; 2 nasopharynx; 1 eye; 1 cervical; 1 unidentified
Citrobacter diversus	1	proficiency
Citrobacter freundii	6	3 proficiency; 1 wound; 1 sputum; 1 urine
Clostridium bifermentans	1	eye
Clostridium butyricum	2	1 wound; 1 colostomy
Clostridium cadaveris	1	small bowel
Clostridium innocuum	1	wound
Clostridium paraperfringens	1	urine
Clostridium paraputrificum	1	wound
Clostridium perenne	1	eye
Clostridium perfringens	62	20 ear; 13 eye; 10 abscess; 6 wound; 2 blood; 2 vagina; 2 urine; 1 gall bladder; 1 lochia; 1 stomach aspiration; 1 OS, 1 environment; 1 food poisoning; 1 unidentified
Clostridium septicum	1	blood
Clostridium sordellii	2	1 wound; 1 ruptured appendix
Clostridium sphenoides	1	ruptured appendix
Clostridium sporogenes	4	3 wound; 1 ruptured appendix
Clostridium tertium	3	1 rectal drainage; 1 ear; 1 peritoneal cavity
Clostridium sp.	1	eye
Corynebacterium aquaticum	2	1 CSF; 1 proficiency
Corynebacterium diphtheriae Intermedius, toxigenic	1	proficiency
Corynebacterium diphtheriae Mitis, nontoxigenic	2	1 throat; 1 proficiency
Corynebacterium equi	2	1 wound; 1 eye
Corynebacterium pseudo-diphtheriticum	1	nasopharynx

Corynebacterium pseudo-tuberculosis (ovis)	1	pilonidal cyst
Corynebacterium sp.	43	14 vaginal; 6 abscess; 4 eye; 4 urine; 3 wound; 2 ear; 2 CSF; 1 sputum; 1 blood; 6 proficiency
Eikenella corrodens	4	1 abscess; 1 chest cavity; 1 lymph node; 1 wound
Enterobacter aerogenes	1	proficiency
Enterobacter agglomerans	3	1 urine; 1 abscess; 1 sputum
Enterobacter cloacae	10	2 sputum; 2 wound; 2 abscess; 1 feces; 1 urine; 1 proficiency; 1 burn
Enterobacter hafniae	4	1 sputum; 3 proficiency
Escherichia coli	55	22 urine; 5 wound; 4 abscess; 3 genital; 2 throat; 2 blood; 1 feces; 1 tracheal aspiration; 1 vomitus; 1 sputum; 1 food poisoning; 12 proficiency
Eubacterium lentum	1	abdominal wound
Flavobacterium meningosepticum	1	urine
Flavobacterium Group II-B	2	1 urethral drainage; 1 throat
Francisella tularensis	1	eye
Fusobacterium necrophorum	1	rectal abscess
Fusobacterium nucleatum	1	pleural fluid
Group II-C	1	eye
Group II-F	1	vaginal
Group II-J	1	bronchial
Group II-K	1	cervical
Group IV-C_2	1	cervix
Group VE-2	1	sputum
Group EF-4	1	cat bite
Haemophilus aphrophilus	3	2 throat; 1 abscess
Haemophilus haemolyticus	1	nasal
Haemophilus influenzae, type A	1	nasal
Haemophilus influenzae, type B	13	7 CSF; 2 eye; 1 brain (autopsy); 1 throat; 1 hip; 1 proficiency

Haemophilus influenzae, type E	1	CSF
Haemophilus influenzae, rough	2	1 genital; 1 eye
Haemophilus influenzae, no type or not typed	11	4 throat; 3 eye; 2 nasal; 1 genital; 1 maxillary sinus
Haemophilus parahaemolyticus	2	1 throat; 1 lung (surgery)
Haemophilus parainfluenzae	5	2 throat; 1 sputum; 1 abscess; 1 finger
Haemophilus vaginalis	1	vaginal
Klebsiella ozaenae	4	2 throat; 1 nose; 1 blood
Klebsiella pneumoniae	11	3 urine; 2 sputum; 2 blood; 1 gall bladder; 1 vomitus; 1 wound; 1 proficiency
Lactobacillus sp.	9	3 urine; 2 wound; 1 surface stillborn baby; 1 amniotic fluid; 1 Bartholin gland; 1 vaginal
Listeria monocytogenes	1	proficiency
Micrococcus	5	2 sputum; 1 throat; 1 hip fluid; 1 urine
Moraxella nonliquefaciens	4	2 nasopharynx; 1 eye; 1 sputum
Moraxella osloensis	10	2 vagina; 1 abscess; 1 CSF; 1 sputum; 1 eye; 1 cervix; 1 blood; 1 throat; 1 dog bite
Neisseria gonorrhoeae	2	1 eye drainage; 1 proficiency
Neisseria meningitidis, type A	3	1 CSF; 1 throat; 1 proficiency
Neisseria meningitidis, type B	4	2 CSF; 2 nasal
Neisseria meningitidis, type C	2	1 CSF; 1 throat
Neisseria meningitidis, Slaterus X	1	cervix
Neisseria meningitidis, Slaterus Y	3	2 throat; 1 sputum
Neisseria meningitidis, Slaterus Z	1	eye
Neisseria meningitidis, no type or not typed	5	4 throat; 1 nasopharynx
Neisseria sicca	6	4 sputum; 1 proficiency
Neisseria subflava	2	throat
Pasteurella haemolytica (similar to avian)	1	duodenal abscess
Pasteurella multocida	12	6 dog bite; 1 cat bite; 1 sputum; 1 elbow; 1 thoracentesis; 1 proficiency; 1 unidentified

Peptostreptococcus CDC Group 1	5	1 sebaceous cyst; 1 abdominal abscess; 1 uterine mass; 1 vaginal; 1 blood
Peptostreptococcus CDC Group 2	8	2 abscess; 1 antrum sinus; 1 endocervix; 1 pleural fluid; 1 boil; 1 navel discharge; 1 vaginal
Peptostreptococcus CDC Group 3	9	3 abscess; 1 wound; 1 vaginal; 1 cervix; 1 urine; 1 blood; 1 navel discharge
Peptostreptococcus CDC Group 4	1	lymph node
Peptostreptococcus	3	1 ear; 1 hernia drainage; 1 rectal abscess
Propionibacterium acnes	15	4 blood; 4 abscess; 2 wound; 2 hip tissue; 1 chest cavity; 1 bone; 1 sputum
Propionibacterium granulosum	1	boil
Propionibacterium sp.	1	abscess
Proteus mirabilis	4	2 urine; 1 wound; 1 ear
Proteus morganii	11	3 urine; 2 sputum; 1 abscess; 1 boil; 4 proficiency
Proteus rettgeri	3	1 urine; 2 proficiency
Proteus vulgaris	2	proficiency
Providencia alcalifaciens	2	proficiency
Providencia stuartii	1	urine
Pseudomonas acidovorans	3	1 sputum; 1 throat; 1 urine
Pseudomonas aeruginosa	31	13 urine; 7 sputum; 3 ear; 2 wound; 2 feces; 1 burn; 1 perineal area; 2 proficiency
Pseudomonas alcaligenes	1	urine
Pseudomonas cepacia	8	1 suture pustule; 1 eye; 1 wound; 1 mouth; 1 urine; 1 dog bite; 2 proficiency
Pseudomonas fluorescens	13	4 sputum; 2 throat; 2 abscess; 1 pleural effusion; 1 urine; 1 ear; 1 appendectomy; 1 environment
Pseudomonas maltophilia	14	4 urine; 3 sputum; 3 wound; 1 bronchial washing; 1 chest fluid; 1 endotracheal tube; 1 callus on foot
Pseudomonas pickettii	2	1 conjunctiva; 1 blood
Pseudomonas pseudoalcaligenes	2	1 wound; 1 environment
Pseudomonas putida	6	3 sputum; 1 urine; 1 blood; 1 eye
Pseudomonas putrefaciens	1	finger

Pseudomonas stutzeri	6	5 wound; 1 ear
Pseudomonas sp.	5	2 sputum; 1 bone scraping; 1 chest fluid; 1 urine
Salmonella enteritidis ser. Heidelberg	1	bone cyst
Salmonella enteritidis ser. Paratyphi A	1	proficiency
Salmonella enteritidis ser. Typhimurium variant Copenhagen	2	leg wound
Serratia liquefaciens	3	1 sputum; 1 tracheal secretion; 1 urine
Serratia marcescens	4	1 wound; 1 abscess; 1 sputum; 1 proficiency
Shigella sonnei	1	urine
Staphylococcus aureus	83	various sources; 56 were submitted for phage typing
Staphylococcus epidermidis	12	2 ear; 2 eye; 2 abscess; 1 vaginal; 1 lymph node; 1 blood; 1 endotracheal tube; 1 knee fluid; 1 wound; 1 cervix
Streptococcus faecalis subsp. *zymogenes*	3	2 urine; 1 proficiency
Streptococcus mutans	1	blood
Streptococcus pneumoniae	10	4 eye; 1 CSF; 1 ear; 1 maxillary sinus; 1 throat; 1 sputum; 1 unidentified
Streptococcus, beta hemolytic Group A	11	4 throat (specimen sent in for organism other than streptococcus); 3 abscess; 2 wound; 2 ear
Streptococcus, beta hemolytic Group B	27	7 urine; 3 vaginal; 2 cervical secretion; 2 throat (specimen sent in for organism other than streptococcus); 1 eye; 1 placenta; 1 lung autopsy; 1 amniotic fluid; 1 blood; 1 pelvic drainage; 1 abscess; 1 feces; 1 tracheal aspirate; 1 urethra; 1 sputum; 1 Bartholin cyst
Streptococcus, beta hemolytic Group C	11	3 endotracheal suction; 2 maxillary sinus; 2 throat (specimen sent in for organism other than streptococcus); 2 ear; 1 knee drainage; 1 sputum
Streptococcus, Group D, enterococcus	15	5 wound; 4 abscess; 2 tracheal aspiration; 2 urine; 1 gums; 1 throat
Streptococcus, Group D, non-enterococcus	1	abscess

Streptococcus, beta hemolytic, Group F	7	2 ruptured appendix; 2 wound; 1 blood; 1 abscess; 1 endotracheal secretion
Streptococcus, beta hemolytic, Group G	15	5 abscess; 3 throat (specimen sent in for organism other than streptococcus); 2 lesion; 1 urine; 1 nasopharynx; 1 vaginal; 1 feces; 1 eye
Streptococcus, beta hemolytic Not groups A, B, C, D, F, or G	2	abscess
Streptococcus, alpha	30	various sources
Veillonella parvula	2	1 blood; 1 maxillary cyst
Yersinia enterocolitica	1	water

In determinative bacteriology, 932 significant isolates were obtained from 1,273 specimens at a cost of $22,610 or $17.76 per specimen.

2. Clinical microbiology -

John Hall, Section Head

Specimens received numbered 5740 and 15,274 tests were performed on them. Although surgical bacteriology specimens are included in this total, work in this field is mainly determinative so results are included in the preceeding section. Again this year, special effort has been devoted to speciation of anaerobes using gas chromatography (thermal conductivity). The species included in this study are : Bacteroides corrodens, fragilis subsp. fragilis, fragilis subsp. distasonis, fragilis subsp. thetaiotaomicron, fragilis, melaninogenicus, oralis, sp. CDC Group F-1, sp. CDC Group F-2; Clostridium bifermentans, butyricum, cadavaris, innocuum, paraperfringens, paraputrificum, perenne, perfringens, septicum, sordellii, sphenoides, sporogenes, tertium, Clostridium sp.; Eubacterium lentum; Fusobacterium necrophorum, nucleatum; Peptostreptococcus CDC Group 1, CDC Group 2, CDC Group 3, CDC Group 4, Peptostreptococcus sp.; Propionibacterium acnes, granulosum, Propionibacterium sp.; Veillonella parvula.

a. Enteric Bacteriology

Total specimens 754
Examinations 7762

Salmonella isolated = 77
Enteropathogenic E. coli = 1
Shigella isolated = 153
Other enteric pathogens = 106
Total positives = 337 (45%)

Enteric serogrouping procedures = 250
Enteric serotyping procedures = 143

Salmonella enteriditis serotypes encountered and frequency :

Agona	1	Montevideo	1
Enteriditis	3	Newport	1
Euleritidis	1	Poona	1
Java	2	St. Paul	2
Manhattan	1	Thompson	2
Minnesota	1	Typhimurium	14
		Typhimurium var.Copenhagen	3

Salmonella grouped only :

Group B	23
Group C1	1
Group C2	7
Group D	9
Group F	1

Shigella types encountered and frequency :

Shigella boydii	2
Shigella flexneri 2a	31
Shigella flexneri 4a	8
Shigella flexneri 6	1
Shigella sonnei	111

b. Throat Cultures

Total specimens 3876
Examinations 5051

For C. diphtheriae 13 with one positive
For beta-hemolytic streptococci = 3863

Positives were distributed as follows:

S. pneumoniae	3	Group F	95
Group A	615	Group G	173
Group B	42	Not groupable	117
Group C	128	Other significant organisms	2

Only one batch of isolates was sent to CDC for typing. It was from a suspected epidemic of streptococcal sore throats in Opheim. However, only one out of 14 isolates had an M-type = 4. The T-type on the others was : seven - T 13, four - T 8/25, one - T 11, one - T 12. I doubt whether it will be worthwhile to continue sending isolates of Group A streptococci for typing.

The processing of throat cultures for beta-hemolytic streptococci in the state laboratory is one service we have had to restrict (see Laboratory Bulletin No. 59). This should be done locally. However, because the service is not available in some rural areas, we will continue to provide it on cases of actue pharyngitis. An excellent publication on streptococcal infections is : "Proceedings of the 1974 Great Plains Regional Symposium on Rheumatic Fever" available from the American Heart Association, 12000 Building, 11960 Westline Industrial Drive, St. Louis, Missouri 63141 at $1.00 a copy.

c. Bacterial Serology = 114 specimens

Tested for Brucellosis	= 90	(2 positives)
Tested for Tularemia	= 90	(4 positives)
Leptospirosis, referred to the Rocky Mountain Laboratory	= 24	

d. Laboratory services related to the control of venereal disease.

Syphilis serology	VDRL tests, qualitative	= 34,949	positive	= 1715 (4.9%)
	VDRL tests, quantitative	= 2052		
	FTA-ABS tests	= 853	positive	= 349 (40.9%)
	Spinal fluid -VDRL	= 419	no positives	

Proficiency tests; 10 specimens, four times to 72 laboratories

Approved tests = VDRL and RPR

In-service training is provided in the state laboratory.

Quality control sera will be sent to each participating laboratory twice a year with the proficiency specimens. It was also sent this year on request.

Marriages in Montana, fiscal year 1975	= 7,430
Premarital VDRL's done in state lab	= 5,380
Live births in Montana, fiscal year 1975	= 11,887
Prenatal VDRL's done in state lab	= 7,068

The cost of the serology portion of the VD control program this year was $40,230.

Cultures for Neisseria gonorrhoeae 9,808 specimens
12,008 examinations (9.8% positive)

Genital smears, male = 57

The cost of this service for fiscal year 1975 was $24,577.

Here is a summary of the culturing program by month and by program.

Month	No.tested	No.positive	VD Program		Family Planning	
			No.	No.positive	No.	No.positive
July	736	89	272	81	464	8
August	881	103	338	94	543	9
September	697	83	212	71	485	12
October	812	96	297	85	520	11
November	855	85	276	68	579	17
December	738	81	271	68	467	13
January	845	79	254	75	591	4
February	704	67	195	63	509	4
March	883	71	261	59	622	12

April	879	78	263	68	616	10
May	917	63	297	54	620	9
June	856	66	244	54	612	12
TOTALS	9,808	961	3,180	840	6,628*	121
		9.8%		26.5%		2%
	(7,701)	(611)	(1,823)	(295)	(5,878)	(316)

*Our initial agreement with The Family Planning Program specified 6,000 cultures a year; @ $2.50 for an allottment of $15,000.

The work in the Microbiology Laboratory Bureau having to do with venereal disease was reviewed in June by Alwilda L. Wallace, Consultant, Laboratory Training and Consultation Division, Bureau of Laboratories, Center for Disease Control, Atlanta, Georgia.

Testing for VD has legal status in connection with prenatal and premarital examinations and with control programs. Section 69-4613.109, RCM 1947 provides that supervisors of all laboratories in Montana performing tests for venereal diseases, including serologic procedures, cultural work or other tests, shall make a report of all positive or reactive results to the Department. Our reports go to the Chief, Preventive Health Services Bureau.

Our total cost of laboratory services for VD control this year was $64,807 ($59,351).

(Numbers in ( ) are from the 1974 report.)

e. Surgical Bacteriology -

John Hall, Section Head Specimens = 1273

Activity in this specialty consists largely of determinative bacteriology. Organisms speciated, with source, are listed in (1.). About half of the specimens consist of organisms already isolated in another laboratory; the rest are the primary swab, fluid, or tissue. Surgical bacteriology is our main source of anaerobes. The study of anaerobes involves highly technical procedures so referral to us for speciation is justified. I would say that a complete work-up on this group of bacteria is feasible only in hospitals of 500 beds or larger, but our largest general hospital in Montana is about 250 beds. On any particular day, the microbiologist may be studying isolates from abdominal fluids, appendices, abscesses in various sites, tumors, a bile duct, urines, wounds, a pilonidal cyst, and drainages from various lesions; at least he was on October 28. Additional time is consumed delineating species which are "normal" flora from those considered to be pathogenic, or opportunistically so.

f. Screening of newborn for inborn errors of metabolism.

Live births in Montana : fy '75 = 11,887
cy '74 = 12,083
cy '73 = 11,226
cy '72 = 11,315
cy '71 = 12,229
cy '70 = 12,450

PKU tests on newborn, fy '75 = 10,370

Number of confirmed PKU's this year = 0

Summary for fiscal years 1967 through 1975 :

Number of live births = 103,925
Tests for PKU = 101,493
Cases of PKU = 6
PKU : Live Births 1 : 17,321

There is only one PKU child in Montana under dietary management at the present time. He is three years old and doing very well.

Estimated population of Montana, July 1975 - 735,000

Beginning January 5, 1975, specimens on newborn in Montana have been sent to the Oregon Metabolic Disorders Screening Program. Until May they were tested for phenylalanine, leucine, methionine, tyrosine and galactosemia. The first part of May, Larson's T_4 method was added to detect congenital hypohyroidism. Our contract for fiscal '76 specifies these six parameters. This is quite a breakthrough in the area of infant screening. Although we have a statute requiring tests for more than PKU, it wouldn't have been feasible to set up a complete program in the laboratory for the number of newborn we have. Regionalization seems to be a practical solution. This is especially true when consultation with a major medical center is included. Data through June 24 is :

Total specimens = 5,717 ; with T_4 done on 2,104

Some abnormal findings have been encountered but, when follow-up studies were completed, they were not confirmed.

In the Oregon Program, the stated objective for Montana is : "As part of the contractual arrangement with the State of Montana to assure that children born in Montana with PKU, tyrosinemia, galactosemia, maple syrup urine disease, and homocystinuria are identified and brought under early treatment so that by the age of six years they would demonstrate a distribution of growth and development achievement equal to that of the total population of six year olds." Since this was written, screening for congenital hypothyroidism by Larson's T_4 method has been added to the program.

3. Mycobacteriology, Parasitology and Mycology -

Mel-Iden Chambers, Section Head

a. Mycobacteriology

Total specimens received 4,297 (3181)('73- 2873)

Smears	5,092
Cultures	17,769
Biochemical	554
Total exams	23,415

Antibiotic susceptibility	94
Referred cultures to State	45
Referred cultures to CDC	15

M. Tuberculosis	237	Atypical mycobacteria :	48
		M. flavescens	3
		M. gordonae	27
	Group IV	Not *fortuitum*	2
		M. bovis	1
		M. kansasii	9
		M. avium-intracellulare	4
		M. fortuitum complex	1
		M. xenopi	1

b. Parasitology

Total specimens 386 (380) Parasites identified 140

Protoza	85	Helminths	55
Entamoeba coli	29	Trichuris trichiura	19
Giardia lamblia	21	Taenia	1
Entamoeba histolytica	6	Schistosoma mansoni	1
Chilomastix mesnili	6	Hookworm	7
Endolimax nana	14	Hymenolepis nana	4
Dientamoeba fragilis	1	Diphyllobothrium latum	1
Entamoeba hartmanni	6	Fasciola hepatica	1
Iodamoeba butschilli	2	Gordius sp	1
Enterobius vermicularis eggs	2	Strongyloides larva	1
Ascaris lumbricoides	16	Clonorchis sinensis	1

Parasitology Serology (Referred to CDC)

Toxoplasma	54 received	3 positive
Malaria	3 received	0 positive
Amoebiasis	7 received	0 positive
Trichinosis	3 received	0 positive

c. Mycology Serology (Referred to CDC)

Histoplasmosis	50 received	2 positive
Blastomycosis	50 received	0 positive
Coccidioidomycosis	50 received	2 positive
Candidiasis	3 received	0 positive
Cryptococcosis	3 received	0 positive
Aspergillosis	1 received	0 positive

Mycology Total specimens received 251 (175)

Dermatophytes :

Trichophyton rubrum	5
Trichophyton mentagrophytes	4
Trichophyton tonsurans	1
Trichophyton verrucosum	1
Microsporum canis	4
Epidermophyton floccosum	1

Subcutaneous

Fonsecaea pedrosi	1
Allescheria boydii	1
Sporothrix schenkii	2
Streptomyces sp	3

Systemic

Coccidiodes immitis	3
Nocardia asteroides	1

Yeasts :		Contaminants :	
Candida albicans	28	Alternaria sp	1
Candida guillermondii	2	Aspergillus sp	13
Candida Krusei	3	Beauveria sp	1
Candida parapsilosis	12	Cephalosporium sp	2
Candida stellatoidea	1	Cladosporium sp	12
Candida tropicalis	7	Fusarium sp	1
Cryptococcus albidus	3	Mucor sp	4
Cryptococcus gastricus	1	Paecilomyces sp	2
Cryptococcus laurentii	1	Penicillium sp	14
Rhodotorula sp	4	Phoma sp	3
Torulopsis glabrata	9	Scopulariopsis sp	2
Trichosporon cutaneum	2	Sepedonium sp	1
Saccharomyces cerevisiae	3	Streptomyces sp	3
		Syncephalastrum sp	2
		Trichophyton terrestre	1

Numbers in ( ) refer to figures from the 1974 report

4. Virology -

Robert Clark, Section Head

Total specimens processed through the virus laboratory = 20,688
For virus isolation = 278
For serological testing = 20,410
Source of specimens for isolation attempts : throat swabs = 98; rectal swabs = 78; spinal fluids = 34; blood = 16; tissue = 8; other = 44.

	SEROLOGY		VIRUSES ISOLATED
	No.Tested	No.Positive	
Influenza Group A	258	40	6
Influenza Group B	258	0	0
Adenovirus	282	3	1
Mycoplasma pneumoniae*	203	22	not done
Mumps (meningoencephalitis)	35	0	0
Rubeola	179	15	1
Colorado Tick Fever	100	7	3
Rockey Mt. spotted fever*	100	1	0
Q Fever*	5	0	0
Western Equine Encephalitis	26	0	0
Rubella (diagnostic specimens)	149	12	0
Infectious mononucleosis (Ox-cell)	76	31	
Respiratory Syncytial Virus	2	0	
Parainfluenza 1,2,3	2	0	
Typhus*	3	0	
Richettsialpox*	3	0	
Herpes simplex	195	21	2
St. Louis Encephalitis	26	0	0

*Tests for PPLO and rickettsiae are done in the virus laboratory.

Greatest failures during the year were in isolation of enteroviruses and Herpes II from clinical specimens. I attribute this to a deficiency in collecting the right specimens at the right time rather than to any lack of capability on our part. This problem will be discussed in an early issue of the Bulletin.

We were expecting a sizeable influenza epidemic this year, but it almost missed us. The first isolates were made from cases in Montana and North Dakota with January 15 as the date of onset. The greatest number of cases occurred during the second week in February; although we were still receiving specimens the first part of March. It didn't turn out to be much of an epidemic. The isolates sent to CDC for antigenic analysis proved to be the subvariant: A_2 / Port Chalmers / 1/7 (H3N2). Here is a current listing of multi-case outbreaks of viral influenza which have been studied in my laboratories in Montana.

1956 - A_1	1966 - A_2 ; B
1957 - March - A_1	1968-1969 fall-winter - A_2
1957 - Aug.-Oct. - A_2	1970 - A_2
1959 - B	1971 - B
1960 - A_2	1971-1972 fall-winter - A_2
1962 - B	1973 - A_2
1963 - A_2	1974 - B
1964 - A_2	1975 - A_2

Herpes simplex (Herpesvirus I) was isolated from spinal fluid of a newborn who died of encephalitis a few days after birth.

Specimens to be tested for evidence of chlamydial infections (psittacosis group are sent to the Rocky Mountain Laboratory in Hamilton. Inclusion conjunctivitis is still present on Indian Reservations.

Specimens to be tested for the presence of Hepatitis B antigen (HB_sA_g) are sent to the Phoenix Field Station of the Center for Disease Control. Out of 146 sera sent, 18 were positive. They use both the RIA (radioimmune assay) and CEP (counter-electrophoresis) procedures.

Some of the original funding for our virus laboratory came from a grant to determine neutralizing antibodies in persons through 21 years of age as a means of assaying the immune status of the population. However, on the advice of the Chief, Preventive Health Services, this was discontinued in May. Results of tests done this year follow :

Number of tests - 307 Positive against all three types (immune) - 97 (32%)
Last years figure was 33% immune - it has hovered around this level for several years.

susceptible to one or more types	=	210
negative with all three types	=	6
positive against type 1 only	=	33
positive against types 1 and 2	=	55
positive against types 1 and 3	=	28
positive against type 2 only	=	26
positive against types 2 and 3	=	43
positive against type 3 only	=	19

Tests for immunity to Rubella are required both by premarital (MAC 16-2.26(2)-S2620) and prenatal (MAC 16-2.18(6)-S1840) regulations. A questionnaire is sent with each negative report asking if the patient is pregnant and whether the physician intends to immunize her. Recommendations are printed on the reverse side of the form. They are returned to our Health Services Division in a preaddressed, business-reply envelope. Also a list of negative reactors is furnished weekly to Preventive Health Services. Here is a tabulation of Rubella-Hemagglutination tests done this year :

Month	Number tested	Number non-immune	Prenatal	Premarital	Family Planning	Diagnostic	Other
July	2068	200	689	931	378	16	54
August	1794	180	546	768	318	7	110
September	1643	213	812	481	309	1	40
October	1483	162	426	426	412	10	63
November	1499	166	659	407	362	9	62
December	1774	204	754	546	394	10	70
January	1187	118	589	345	284	11	58
February	1394	150	655	295	370	13	61
March	1771	202	824	438	377	27	105
April	1338	151	638	301	328	12	59
May	1346	136	510	454	312	18	52
June	1693	218	569	755	282	15	72
TOTALS	18,945	2,100 (11.1%)	7,671	6.147	4,126	149	806
1974 report-	18,682	1,599 (8.7%)	8,656	4,826	4,677	633	-

Cost of Rubella program in the laboratory : 18,945 x $1.36 = $25,765.

Viruses identified in CDC proficiency tests : ECHO 6 and 9; Adenovirus 11 and 7; Measles; Mumps; Herpes simplex; Parainfluenza 3; Influenza A; Coxsackie B 3.

5. Registration of laboratories and personnel ; training and consultation.

Montana Administrative Codes 16-2.26 (2)-S2610, Approval of Laboratories; and 16-2.22 (1)-S2200, Hospital and Medical Facilities (f) Laboratory, provide for the registration of laboratories and personnel performing medical and public health laboratory tests. Those laboratories serving fewer than three physicians are exempt. Presently there are 110 laboratories in Montana registered with the Department. They include 69 hospital laboratories, 6 laboratories classified as "Independent Laboratories" under Medicare, and 35 others. The current personnel registry contains 550 names. This does not include medical and osteopathic physicians, chiropractors, and podiatrists duly licensed by the State of Montana; persons employed in laboratories operated and maintained exclusively for research and teaching purposes, involving no patient or public health services whatsoever; and persons employed in clinical and research laboratories operated by the United States Government.

From our registration forms, we counted 1,123,618 laboratory tests performed in calendar year 1975. Additionally, we estimate that 374, 387 tests were done in physician-office laboratories. This gives a round figure of 1,500,000 clinical laboratory procedures done in Montana in 1974. For the same period, CDC has put out a figure of $2.75 as the average cost per test. This represents an expenditure of $4,125,000. I suspect that, if you compared actual billings, it would prove to be higher. Based on a population of 735,000, this represents two procedures per person, per year.

We administer the National Proficiency Examinations for Cytotechnologists and Clinical Laboratory Technologists. Results of the first round in March were : for Cytotechnologists, one out of three passed the examination; for Clinical Laboratory Technologists, nine out of thirty-six examinees passed.

Regulations of our Hospital and Medical Facilities Division, which in turn are guided by Medicare, require participation in external quality control systems (proficiency tests) in all categories in which services are offered. This must be either a state-operated or state-approved system. We provide proficiency tests in syphilis serology (72 laboratories) and bacteriology (70 laboratories). Laboratories doing tests in these categories are required to participate satisfactorily in the state-operated systems. For other testing, state-approved programs include those of the College of American Pathologists, the American Society of Internal Medicine, and the American Association of Bioanalysts.

Course No. 1, Bench Training in Clinical Microbiology, in the continuing education series for technologists sponsored by the Montana Medical Education and Research Foundation, is given in our laboratory by Milton H. Brown, Chief, Microbiology Laboratory Bureau. Provision is made to accomodate 20 students per year by individual arrangement. That this has been a highly successful venture was indicated when the Montana Society for Medical Technology, at their annual convention this year, awarded Bud Brown a certificate for "MANY YEARS OF SERVICE TO MONTANA MEDICAL TECHNOLOGISTS IN THE FIELD OF CONTINUING EDUCATION."

Consultation is a rather extensive operation with us. Significant findings are reported by telephone and this frequently leads to further inquiries. Professionals in our laboratory are expected to have knowledge and experience beyond that required to perform their daily testing. Units in state government should be a source of leadership, coordination and reference. They shouldn't attempt to supplant local agencies but should assist them to perform functions which they should be carrying on themselves. Visitors are always welcome in the laboratory. Frequently we have persons who wish to observe for a shorter period than the week required in the course. We also cooperate in the Career Development Program at the high school. A small class of students, which is oriented towards the medical sciences, comes to the laboratory for two periods each week. Then we have six work-study students from Carroll College who are an essential part of our staff.

On our part, we participate in more than 16 proficiency testing systems; either as a participating laboratory or a reference laboratory. Bud Brown continues as one of two reference laboratories for CDC's bacteriology system.

6. Sanitary and Environmental Microbiology -

Ella Mae Howard, Section Head

a. Food bacteriology — Samples tested 294

Origin:		
Consumer complaints	=	50
Food poisoning	=	44
Ground beef survey	=	200

Examinations performed :

Aerobic plate count	436
Psychrophilic plate count	8
Coliform MPN	110
E. coli MPN	1105
Coagulase positive staphylococci, MPN	188
Salmonella	96
C. perfringens	24
Streptococci	2
Physical examination-identification	60
"Can" examinations-check for growth	155
Total examinations	2,184

Food-sampling kits were improved this year. They now include metal seals and polyfoam outer containers. They are supplied to all county sanitarians and are to be used only for collecting food items to be submitted to the state laborarory. In spite of all this, we still are experiencing difficulty in obtaining satisfactory food samples.

In cooperation with the Food and Consumer Safety Bureau, over 200 samples of ground beef, collected from retail stores, were tested for fecal coliforms and total count on aerobic plates. This was primarily a project to establish guidelines although some states have gone as far as to set legal limits for total bacterial content and fecal coliforms.

b. Water bacteriology (water pollution testing and drinking water testing)

Total water samples tested — 13,126

Origin:

Private supplies	2539
Municipal supplies	8416
Federal Agencies	1143
State Agencies	349
Water Quality (pollution studies)	143
MPN - Municipal source water	341
Swimming-wading pools	26
Schools - rural	123
Distilled - water suitability	19
Iron bacteria	3
Other	24

Examinations performed :

Negative presumptive	8772
Positive presumptive	1779
Confirmed positive	1285
Completed	392
Membrane filter verification	248
MF verification - other labs	44
5-tube fecal coliform	68
Total coliform - MPN	724

Fecal coliform - MPN	144
Fecal streptococci - MPN	18
Membrane filter	
Total coliform (Municipal)	3063
Total coliform (Raw waters)	142
Fecal coliform	290
Fecal streptococci	52
Identification - fecal streptococci	12
Iron bacteria - identification	3
Salmonella	4
Yersinia*	4
Bacteriological suitability test on distilled water**	19
Plate count	9
Sulfate reduction	2
Turbidities	512
TOTAL EXAMINATIONS	17,586

*Yersinia enterocolitica was isolated from a municipal supply.
**This test is run for other laboratories.

Samples showing contamination :

Municipal supplies	= 3.5 percent
Private supplies*	= 22.9 percent
Federal agencies	= 10.7 percent
State agencies	= 9.4 percent
Schools	= 12.1 percent

*During the floods in June, this rate rose to 69. percent

Total number of specimens received in the section = 13,420 (12,733)

Total examinations carried out on these specimens = 19,770 (19,852)

Numbers in ( ) are from the 1974 report.

Water bacteriology was inspected and certified by Edwin Geldreich, Consulting Bacteriologist, Environmental Protection Adminstration, Cincinnati. We always look forward to Mr. Geldreich's visit because of the benefits to our program. This one was no exception and we were well pleased with it. Several changes have been made as a result of consultation with him. Laboratory people now review results on samples from municipal supplies and, for those not meeting the standards, repeat sample bottles are sent out immediately. This is done prior to sending reports to the Water Quality Bureau. Other suggestions made by Mr. Geldreich have also been implemented.

During the June floods in Montana, John Manhart from the Regional EPA Laboratory in Denver came to our laboratory and helped out for two weeks. During this time, unsatisfactory results on samples from private supplies increased to 69 percent from the usual 20-30 percent.

Certification of laboratories performing bacteriological tests on drinking water is a responsibility of this section. During the year, ten laboratories in the state doing water bacteriology were inspected and certified. Currently there are 14 laboratories which are inspected and certified. Two of them are certified for wastewater analysis only; the rest are certified for potable and/or wastewater testing. Additionally, one laboratory received a provisional certification. Continuing education is also a responsibility of the section. Five educational presentations were given this year and we have had visitors in the laboratory to observe the work in water bacteriology. Our

clientele includes water and wastewater plant operators, sanitarians, and college students. We also are tooling up for the "Safe Drinking Water Act", P.L. 93-523, 40 CFR, part 141 which may be implemented in Montana by July 1976.

7. Services to Health Facilities on the Indian Reservations.

One of our most important contacts with Local Health Facilities is the testing which we provide through the Indian Health Service for their hospitals and clinics located on the Reservations. These are at Box Elder, Browning, Crow Agency, Harlem, Lame Deer, Poplar, St. Ignatius (Holy Family), Fort Washakie, and Billings Area in Billings. A monthly report of tests performed is sent to IHS in Billings. However, reimbursement is not received because Indians are citizens of Montana and are entitled to all services provided to other residents of the State. Here is a summary of tests, with cost, which were done in our laboratory during the year.

		Number	Cost
Throat cultures for beta-hemolytic streptococci	@ $1.20	472	$566.40
Screening of newborn for PKU	@ $1.02	175	178.50
Screening of newborn for errors in metabolism*	@ $4.00	167	668.00
Culture for acid-fast organisms (especially M. tuberculosis)	@ $7.40	1713	12,676.20
Antibiotic sensitivity test on mycobacteria	@ $11.30	47	531.10
Identification of organism and culture**	@ $5.70	353	2012.10
Rubella hemagglutination-inhibition (premarital and prenatal)	@ $1.36	554	753.44
Tissue culture for detection of viruses	@ $25.40	34	863.60
Serological test for viral antibodies	@ $5.10	84	428.40
VDRL for syphilis	@ $1.00	4559	4559.00
FTA-ABS for syphilis	@ $5.70	180	1026.00
Tularemia-brucella agglutination test	@ $2.30	6	13.80
Test for infectious mononucleosis (ox-cell hemolysin)	@ $2.30	2	4.60
Examination for parasites and ova	@ $5.40	172	928.80
Culture for Neisseria gonorrhoeae	@ $2.50	130	325.00
Bacteriological analysis of drinking water	@ $4.00	157	628.00
Mycology - culture for fungi	@ $5.70	55	313.50
TOTALS		8,860	$26,476.44

Average cost per test = $3.00 (the larger number for TB brings the average cost up)

* Beginning in January 1975, the PKU program was expanded to include other inborn errors of metabolism. Specimens are sent to the Metabolic Disorders Unit in the Oregon Public Health Laboratory to be screened for phenylalanine, leucine, methionine, tyrosine, galactose, and thyroid deficiency.
** For fiscal year 1976 it will be necessary to separate specimens for determinative bacteriology from such things as enteric cultures. The former require considerably more time and attention than isolation and identification of Shigella, for instance. The per-specimen cost for determinative bacteriology is $17.76.

The American Indian population on the Reservations we serve is 18,607. Therefore, our per capita expenditure for clinical analytical services is $1.439. This compares with a per capita expenditure for these services of $0.353 for other residents of the State. Based on prenatal serologic tests, we estimate that there were 350 live births among Reservation Indians this year. The female to male ratio on the Reservations is 49:51. The total American Indian population of Montana is 26,385. (Figures for Indian population are from the 1970 census.)

FISCAL AND BUDGET - LABORATORY DIVISION

Classification and Pay - A statewide classification and pay plan was passed in the 1975 Legislative Session. This is a major milestone for the State. The salary ranges for professional and technical personnel in the Public Health Laboratory effective July 1, 1975, are given in the following table.

Title	Grade	Annual Salary Step 1	Annual Salary Step 13
Administrator	18	$19,948	$23,413
Bureau Chiefs (Chemistry ; Microbiology)	17	18,184	21,649
Chemist IV, Microbiologist IV (Section Heads)	14	13,773	17.239
Chemist III, Microbiologist III	13	12,564	16,029
Chemist II, Microbiologist II	12	11,455	14,618
Chemist I, Microbiologist I	11	10,434	13,332
Laboratory Technician III	11	10,434	13,332
Laboratory Technician II	10	9,514	12,148
Laboratory Technician I	9	8,670	11,077
Laboratory Aide III	8	7,901	10,094
Laboratory Aide II	6	6,565	8,380
Laboratory Aide I	4	5,456	6,969

1. To the basic schedule is added a longevity increment for every five years of uninterrupted service. This ranges from $.058 to $.097 added to the hourly rate. However, the total salary cannot exceed step 13 for any particular grade.

2. Step increases, based on merit, are made annually. They amount to about 2.5 per cent.

3. Heads of Sections are classified at the Grade 14 level.

However, the Legislature did not add money to the total appropriation to cover increases in personnel costs. This had to be taken care of by transfer of funds from operations. Currently, technical and professional time in the laboratory is charged out at $10.87 per hour.

Costs of laboratory tests. The increasing trend to "fee-for-service" in state public health laboratories mandates an analysis of what each service costs. Some of the figures are based on batches of a certain size. However, Montana doesn't enjoy the real economy of numbers because we have 735,000 residents spread over 147,000 square miles. Our cost per test, therefore, may be higher than in more populous areas. After the results of the 1970 census were in, we calculated a "space factor" for each state; Montana's was 3.99 compared to 0.62 for New Jersey. In theory, then, Montana should receive $3.99 to New Jersey's $0.62 when distribution of Federal funds is based on a capitation formula.

Some costs in the Chemistry Laboratory Bureau have been listed in that section of the report. Here are figures for the Microbiology Laboratory Bureau.

Procedure	Estimated cost
Environmental microbiology :	
Water - total coliform	$4.00
Water - MPN	10.00
Water - fecal coliform	6.00
Water - fecal streptococci	6.00
Water - four-dilution plate count, drinking water	5.00
Water - six-dilution plate count, raw water	7.00
Food - bacteriological analysis	15.80

Microbiology for Disease Prevention and Control:

Throat culture for beta-hemolytic streptococci	1.20
Metabolic Disorders Screening Program for Newborn (Includes tests for phenylalanine, leucine, methionine, tyrosine, galactosemia, and thyroid deficiency)	4.00
Culture for acid-fast organisms	7.40
Antibiotic sensitivity test on Mycobacterium sp.	11.30
Culture for bacteria and identification	5.70
Determinative bacteriology	17.76
Bacterial serology (tularemia-brucella)	2.30
Examination for parasites and ova (parasitology)	5.40
Culture for fungi (mycology)	5.70
Culture for Neisseria gonorrhoeae	2.50
VDRL for syphilis	1.00
FTA-ABS for syphilis	5.70
Serological test for viral antibodies	5.10
Ox-cell Hemolysin test (infectious mononucleosis)	2.30
Rubella hemagglutination-inhibition test (prenatal, premarital, etc.)	1.36
Tissue culture for presence of viruses; and identification	25.50

The Budget. Funds budgeted to the laboratory amounted to $328,592. Eighty-five percent ($279,303) was spent on analytical services. These are considered to be services to local communities. Thirty-seven percent of the budget was made up from the State General Fund and 63 percent came from Federal sources. Fifty-two percent of the Federal monies ($108,383) came from the Comprehensive Health Grant (314 d); the rest ($98,256) came from various contracts, grants, and agreements to provide laboratory services for federally-funded programs.

The budget does not reflect the actual "cash flow" for laboratory services. For instance, there are seven full-time-equivalents (FTE) working in the laboratory whose salaries, benefits, operating expenses, and equipment costs are not supported by our budget. We also average about five work-study students from Carroll College in the laboratory at any one time. The estimated additional cash flow from external sources for 1975 was $230,000. This gives an actual amount of $558,592 spent on laboratory services.

Here is a look at our budget for fiscal year 1976.

Income (assets)			Expenses (liabilities)	
Federal			Salaries	$252,900
Comprehensive Health Grant (314 d)	$107,000		Employee benefits	35,355
Maternal and Child Health	10,800		Operating expenses	49,496
Grants and Contracts	61,391		Equipment	2,319
Other Federal	25,447			
Total Federal	$204,638	(60%)		
State of Montana General Fund	$135,432	(40%)		
Total	$340,070		Total	$340,070

Additional "cash flow" as indicated in the '75 discussion is expected to be about $240,000 for a total of $580,070 to be expended on laboratory services. Practically all of the $240,000 comes from Federal sources so this means that about 76.3 percent of our "cash flow" in the laboratory is underwritten by the Federal taxpayer. Therefore, we have responsibilities extending beyond the boundaries of Montana and I instruct my people to respond willingly to requests for assistance on the regional or national level.

The most troublesome aspect of this budget is the ratio of personnel costs ($288,255) to other expenses ($51,815). It is 85:15. To operate a public health laboratory at a ratio very far from 75:25 is most difficult. ~~When the Legislature enacted the pay plan, a budget amendment was provided to cover the increased costs from January 1 to June 30, 1975. Nothing additional was provided for the next biennium. Therefore, in making up the 1976 budget, it was necessary to deduct money from operating expenses and equipment and add it to personnel costs. For example,~~ in 1975 we spent $65,611 for operating expenses compared to $49,496 budgeted for 1976. Equipment in 1975 came to $21,852 compared to $2,319 budgeted for 1976.

What is the solution to this dilemma? Some states have gone to "fee-for-service" in the laboratory. This is one way of recovering some costs from third-party payors; one thing the "Feds" have been urging us to do, especially in Maternal and Child Health. In the various proposals for National Health Insurance, and also in existing insurance plans, preventive health services are largely neglected. Perhaps our continued viability depends on this approach.

The laboratory budget, in reality, is made up of seven separate ones, as follows:

Communicable disease control - Laboratory	$99,500
Health Services - Laboratory	22,800
Health Care Facilities - Laboratory	57,334
Environmental Sciences - Microbiology Laboratory	60,325
Highway Alcohol - Chemistry Laboratory	49,611
Environmental Sciences - Chemistry Laboratory	43,600
Lead-based Paint Poisoning - Chemistry Laboratory	6,900
Total, fiscal year 1976	$340,070

Respectfully submitted,

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Laboratory Division
State Department of Health and Environmental Sciences
November 18, 1975

16-2.26(2)-S2620 PREMARITAL SEROLOGICAL TESTS

(1) Approved laboratory. Tests required for marriage shall be done in a laboratory approved by the department of health and environmental sciences.

(2) Certificate Form H.L. 38. Submission of blood or serum sample for testing to determine rubella immunity shall be sufficient to allow issuance of a license. The following statements shall appear on the certificate of physician form and shall be appropriately checked:

(a) "Rubella test not required"

(b) "Specimen has been submitted for Rubella test"

(3) Exemptions. The following applicants shall be exempt from the requirement for a test to determine rubella immunity:

(a) All male applicants,

(b) All female applicants fifty (50) years of age or older,

(c) Any woman incapable of bearing a child because of prior surgery or other physical condition.

(4) Reporting result of Rubella test. The physician shall make a reasonable attempt to report the result to the applicant. (History: Sec. 48-137, R.C.M. 1947; NEW, Order MAC No. 16-2-6; Adp. 11/30/73; Eff. 1/5/74; MAC Not. No. 16-2-19.)

MONTANA ADMINISTRATIVE CODE 16-689.1

16-2.18(6)-S1840 PRENATAL CARE, SEROLOGICAL TEST FOR

(1) Approved blood tests. The approved tests shall include a standard serological test for syphilis, rubella immunity, and blood group including O, A, B, AB, and Rho(D).

(2) Approved laboratory. The required prenatal tests shall be done in a laboratory approved by the department of health and environmental sciences. (History: Sec. 69-6701 through 69-6703, R.C.M. 1947; NEW, Order MAC No. 16-2-6; Adp. 11/30/73; Eff. 1/5/74; MAC Not. No. 16-2-21.)

MONTANA ADMINISTRATIVE CODE 16-414.1